

With reference to the description of the mode of functioning of a sensor system of type R, the mode of functioning of an inventive sensor system 1 will be explained in terms of the present example:

The analytical unit 40 analyzes the sensor data delivered by the sensor unit 10, and in particular by the sensor-signal processing unit 25 (such as the signal outputs  $D_1, D_2 \dots D_n, D_{n+1} \dots D_N; A_1, A_2 \dots A_k, A_{k+1} \dots A_K$ ) as well as other data that may be present (possibly transmitted through the control signal lines  $S_1 \dots S_l, S_{l+1} \dots S_l$ ). We shall now discuss the system operation assuming that this analysis by the analytic unit 40 determines that it would be beneficial to change a parameter in the sensor unit 10 (e.g., parameter memory 26).

In one example, the analytical unit 40 may determine that the subtraction of the AC component  $U(M_{AC})$  needs to be corrected again, during running operation, by a correction value  $U$ , so as to achieve better performance of the overall system. The correction value  $U$  is therefore calculated in the analytical unit 40 (i.e., outside the sensor unit 10). The correction value  $U$  is now set, for example, in the digital signal processing unit 28 (i.e., within the sensor unit 10) so that the following signal processing operation can be performed:

$$U(M_{AC}) \Rightarrow U(M) - \int_{t_2}^{t_1} U(M) dt + \Delta U$$

$$Out_{new} = \begin{cases} 1, & \text{if } (U(M_{AC}) > G_1) \\ 0, & \text{if } (U(M_{AC}) < G_2) \end{cases} \quad \begin{matrix} Out_{old} = 0) \\ Out_{old} = 1) \end{matrix} \quad (5)$$

$U(M_{AC})$  represents the AC component of the internal voltage signal  $U(M)$ , and  $\Delta U$  represents the correction value introduced above. The new output signal  $Out_{new}$  differs from the original, old output signal  $Out_{old}$ , as in the example described above, if the AC component  $U(M_{AC})$  - which has

been changed due to the correction value  $\Delta U$  - now lies above the corresponding threshold  $G_1$  or below the threshold  $G_2$ , as a result of this change.

According to an aspect of the invention, the parameter set in the parameter memory 26 can be corrected for example by the analytical unit 40 transmitting the value of the correction  $\Delta U$  as a parameter during running operation of the sensor unit 10, over one or more of the existing connection lines between the sensor unit 10 and the analytical unit 40. These connection lines are identified in the example by the reference symbols  $A_1, A_2 \dots A_k, A_{k+1} \dots A_K$ .

The transmission or transfer process of the new parameter data to the sensor unit may not disturb the ongoing transmission of signals from the sensor unit 10 to the analytical unit 40. For example, in the case of time-critical systems in motor vehicles, such as measurements of the rotation angle of a gear wheel (camshaft, crankshaft, or ABS), the temporal representation of the angles ( $Out_{old} = "1"$  to  $Out_{new} = "0"$  or vice versa) must not be disturbed by the correction process.

To clarify the invention, FIG. 2 shows another inventive sensor system 200 comprising a sensor unit 10 and an analytical unit 40, connected to the sensor unit by a connecting line A. The sensor unit 10 and the analytical unit 40 are supplied with electrical power from the electric power supply unit 50, at a voltage  $U_B$  via the supply line V. A physical or chemical measurement variable M can be conducted to the sensor system 1 on a line 14, so as to be transformed and processed in the sensor unit 10 in the manner described above. It is transmitted as an output signal Out through the connecting line A to the analytical unit 50.

Signal processing in the sensor unit 10 is characterized in the present example by the programmable parameters ( $C_1, C_2, C_3 \dots C_m, C_{m+1} \dots C_M$ ). Further, for example, two of the control signal lines assigned to analytical unit 40 are shown, through which the control signals  $s_i$  and  $s_{i+1}$

can be conducted to the analytical unit 40.

FIG. 2 shows the interaction between the analog measurement variable  $M$  of the sensor unit 10 and the analytical unit 40. The arrows labeled with the reference symbols 14 and 15 show the direction of information and data flow when a measurement effect is determined during ongoing operation of the sensor system 200. In particular, the arrow 15 between the sensor unit 10 and the analytical unit 40 shows the data flow when data are transferred from the sensor unit 10 to the analytical unit 40 - in the case of a programmed sensor unit 10 in the "locked" state.

Previously known sensors have only one possible way to influence the parameters  $C_1, C_2, C_3 \dots C_m \dots C_M$ , which are stored in the sensor unit 10. The present invention now specifies that the analytical unit 40 analyzes the signal Out (and possibly other operating parameters of the sensor unit 10). Advantageously, it is also possible to draw upon other control signals  $s_i$  and  $s_{i+1}$  for this analysis, that is control signals which are independent of the sensor unit itself. By the data available to it the analytical unit 40 now regularly checks the validity of the parameter set  $C_1, C_2, C_3 \dots C_m \dots C_M$ .

By way of example, a sensor system 1 is considered below whose sensor unit 10 monitors a system that includes a permanent magnet and a gear wheel. By measuring the magnetic field of the gear wheel, the sensor unit 10 represents its rotation by a time-domain pulse train. The output signal Out, which is sent to the analytical unit 40, consists of a sequence of "0" and "1," which, for example, can be transmitted through an open-collector-output.

For the sake of simplicity, let us assume that the analytical unit 40 can modify the processing of sensor signals (generally designated as the sensor algorithm) by a single parameter, namely the correction value  $\Delta U$ . If the analytical unit 40 determines that the correction value